

## AMENDMENTS TO THE CLAIMS

1. (Currently amended) An ~~proteorhodopsin gene~~ isolated DNA molecule, comprising a  
nucleotide sequence encoding a proteorhodopsin protein with at least 78% amino acid  
5 identity to Sequence ID No:7, wherein ~~from a naturally occurring marine gamma-~~  
~~proteobacterium of Sequence ID No:1, said proteorhodopsin gene encoding a~~  
proteorhodopsin protein ~~has~~ing a secondary structure of seven transmembrane  $\alpha$ -  
helices ~~that form a~~ and a retinal binding pocket in which retinal is covalently linked.
- 10 2. (Currently amended) The isolated DNA molecule of claim 1, wherein said DNA  
molecule is isolated from a source selected from the group consisting A  
~~proteorhodopsin gene retrieved from a genomic fragment of a sample~~ of naturally  
occurring bacteria, marine proteobacteria, gamma-proteobacteria, SAR86 bacteria,  
bacterioplankton extracts, recombinant DNA libraries containing derived from said  
15 naturally occurring bacteria, or bacterial artificial chromosome libraries ~~containing~~  
derived from said naturally occurring bacteria, ~~said proteorhodopsin gene encoding a~~  
~~proteorhodopsin protein having a secondary structure of seven transmembrane  $\alpha$ -~~  
~~helices that form a pocket in which retinal is covalently linked.~~
- 20 3. (Cancelled)

4. (*Currently amended*) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim ~~21~~, wherein said ~~proteorhodopsin gene~~ is nucleotide sequence comprises Sequence ID No:6 and said ~~proteorhodopsin protein~~ is Sequence ID No:7.

5. (*Currently amended*) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim 37, wherein said proteorhodopsin-specific primers include three nucleotides encoding a non-native amino acid, creating a new restriction endonuclease site not present in the native sequence of said isolated DNA molecule ~~proteorhodopsin gene~~, thereby allowing subcloning of said isolated DNA molecule ~~proteorhodopsin gene~~ in an expression vector.

6. (*Currently amended*) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim 41, wherein said bacterium is *E. Coli*.

7. (*Currently amended*) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim ~~12~~, wherein said nucleotide sequence comprises ~~genomic fragment is retrieved from a clone BAC31A8, said proteorhodopsin gene is~~ Sequence ID No:4 and said ~~proteorhodopsin protein is~~ Sequence ID No:5.

8. (*Withdrawn*) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC40E8, said proteorhodopsin gene is Sequence ID No:8 and said proteorhodopsin protein is Sequence ID No:9.

9. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC41B4, said proteorhodopsin gene is Sequence ID No:10 and said proteorhodopsin protein is Sequence ID No:11.

5 10. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone BAC64A5, said proteorhodopsin gene is Sequence ID No:12 and said proteorhodopsin protein is Sequence ID No:13.

11. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
10 retrieved from a clone HOT0m1, said proteorhodopsin gene is Sequence ID No:14 and said proteorhodopsin protein is Sequence ID No:15.

12. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
15 retrieved from a clone HOT75m1, said proteorhodopsin gene is Sequence ID No:16 and said proteorhodopsin protein is Sequence ID No:17.

13. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
20 retrieved from a clone HOT75m3, said proteorhodopsin gene is Sequence ID No:18 and said proteorhodopsin protein is Sequence ID No:19.

14. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
retrieved from a clone HOT75m4, said proteorhodopsin gene is Sequence ID No:20  
and said proteorhodopsin protein is Sequence ID No:21.

15. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone HOT75m8, said proteorhodopsin gene is Sequence ID No:22 and said proteorhodopsin protein is Sequence ID No:23.

5 16. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB0m1, said proteorhodopsin gene is Sequence ID No:24 and said proteorhodopsin protein is Sequence ID No:25.

10 17. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB0m2, said proteorhodopsin gene is Sequence ID No:26 and said proteorhodopsin protein is Sequence ID No:27.

15 18. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m2, said proteorhodopsin gene is Sequence ID No:28 and said proteorhodopsin protein is Sequence ID No:29.

19. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m5, said proteorhodopsin gene is Sequence ID No:30 and said proteorhodopsin protein is Sequence ID No:31.

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20. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB20m12, said proteorhodopsin gene is Sequence ID No:32 and said proteorhodopsin protein is Sequence ID No:33.

21. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB40m1, said proteorhodopsin gene is Sequence ID No:34 and said proteorhodopsin protein is Sequence ID No:35.

5 22. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB40m5, said proteorhodopsin gene is Sequence ID No:36 and said proteorhodopsin protein is Sequence ID No:37.

23. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
10 retrieved from a clone MB40m12, said proteorhodopsin gene is Sequence ID No:38 and said proteorhodopsin protein is Sequence ID No:39.

24. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
15 retrieved from a clone MB100m5, said proteorhodopsin gene is Sequence ID No:40 and said proteorhodopsin protein is Sequence ID No:41.

25. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
retrieved from a clone MB100m7, said proteorhodopsin gene is Sequence ID No:42  
and said proteorhodopsin protein is Sequence ID No:43.

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26. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
retrieved from a clone MB100m9, said proteorhodopsin gene is Sequence ID No:44  
and said proteorhodopsin protein is Sequence ID No:45.

27. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone MB100m10, said proteorhodopsin gene is Sequence ID No:46 and said proteorhodopsin protein is Sequence ID No:47.

5 28. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB1, said proteorhodopsin gene is Sequence ID No:48 and said proteorhodopsin protein is Sequence ID No:49.

29. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
10 retrieved from a clone PALB2, said proteorhodopsin gene is Sequence ID No:50 and said proteorhodopsin protein is Sequence ID No:51.

30. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
15 retrieved from a clone PALB5, said proteorhodopsin gene is Sequence ID No:52 and said proteorhodopsin protein is Sequence ID No:53.

31. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
20 retrieved from a clone PALB7, said proteorhodopsin gene is Sequence ID No:54 and said proteorhodopsin protein is Sequence ID No:55.

32. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
retrieved from a clone PALB6, said proteorhodopsin gene is Sequence ID No:56 and  
said proteorhodopsin protein is Sequence ID No:57.

33. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALB8, said proteorhodopsin gene is Sequence ID No:58 and said proteorhodopsin protein is Sequence ID No:59.

5 34. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is retrieved from a clone PALE1, said proteorhodopsin gene is Sequence ID No:60 and said proteorhodopsin protein is Sequence ID No:61.

35. (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
10 retrieved from a clone PALE6, said proteorhodopsin gene is Sequence ID No:62 and said proteorhodopsin protein is Sequence ID No:63.

36 (Withdrawn) The proteorhodopsin gene of claim 2, wherein said genomic fragment is  
15 retrieved from a clone PALE7, said proteorhodopsin gene is Sequence ID No:64 and said proteorhodopsin protein is Sequence ID No:65.

37. (Currently amended) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim 1 ~~or~~  
2, wherein said DNA molecule is isolated ~~amplified from said genomic fragment by~~  
polymerase chain reaction utilizing proteorhodopsin-specific primers.

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38. (Currently amended) The isolated DNA molecule ~~proteorhodopsin gene~~ of claim 37,  
wherein said proteorhodopsin-specific primers comprise ~~are~~ Sequence ID No:2 and  
Sequence ID No:3.

39. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 5, wherein said expression vector containing said isolated DNA molecule~~proteorhodopsin gene~~ expresses said proteorhodopsin protein in a host.

5 40. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 39, wherein said host is an artificial membrane system.

41. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 39, wherein said host is a bacterium.

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42. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 41, wherein said host is a cell membrane preparation of said bacterium.

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43. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 39, wherein said host is an eukaryote.

44. (Currently amended) The isolated DNA molecule~~proteorhodopsin gene~~ of claim 43, wherein said host is a cell membrane preparation of said eukaryote.

20 Clams 45-129 (Cancelled).